

Serial No. 10/060,737

PATENT
Docket No. 58027-011100REMARKS

Reconsideration of this application is requested.

The Applicants' thank the Examiner for the courtesy of granting an interview on Dec. 4, 2003.

Independent claim 1 is rejected under 35 U.S.C 103 as being unpatentable over Masel *et al.* (US. 6,193,501). Specifically, the Examiner contends that the intended use of the claimed invention must result in a structural difference between the claimed invention and the Masel prior art, in order to patentably distinguish the claimed invention from the prior art.

Accordingly, claim 1 has been amended to recite the feature of a fluid being supplied through a non-pressurized inlet (support can be found in the specification on page 9, paragraph 45).

Thus, nowhere does the Masel patent teach, disclose, or suggests the use of **non-pressurized connections for supplying a fluid** for combustion process. In fact, the system, as disclosed in the Masel patent, requires the use of high pressure inlets for supplying pressurized reactants (col. 5, lines 48-50). This is unlike the present invention where the inlets are not high-pressure connections and the fluids are in a non-pressurized state (paragraph 43 and 45 of the specification). The advantage of using non-pressurized fluids, according to the present invention, in MEMS based devices is explained below.

All combustion engines require methods of introducing oxidizer and fuel into the combustion chamber. The combustion occurs at gaseous states even if the fuel/oxidizer supplied is liquid or solid. Furthermore, miniature engines are heavily restricted to a gas-phase fuel/oxidizer in the combustion chamber, since liquid or solid particles can easily clog up any small chambers inherent of miniature combustion engines. Thus, if gas-phase fuel or oxidizer is used, appropriate methods of sealing (valves) and supply (pumps) must be included, since a gas will not be displaced without diffusion (which is too slow for applications envisioned by the present invention) or by pressurization. Additionally, a gas will leak unless it is sealed. By

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default, any system that uses gas will, at a minimum, require a valve and/or a pump with pressurized tanks/connections. Clearly, the employed valve and pump will dramatically increase the engine size. Obviously, this is inconsistent with the goal of miniaturization. In contrast, if a liquid is used, then a method of transforming the liquid to a gas is required. Standard engines use atomization, but this requires pump and valves due to the requirement of pressurization. Some engines feed back the exhaust pressures, to provide pump action, but engine throttling is still provided by a fuel valve. In addition, a method of mixing the reactants is also required since fluids do not mix well in small spaces (smaller than $\sim 1\text{mm}^3$). However, unlike gas, non-pressurized liquids can be transported with specially designed fluidic paths, automatically, due to "sticking" properties of specific liquids with respect to specific wall materials (such as a water column climbing up a small glass tube). Thus, the present invention takes advantage of this and the pulsating combustion nature of invented engine to aspirate the chamber (naturally drawing in the oxidizer, such as ambient air, through an aerodynamically designed **non-pressurized inlet**), since the pulsating nature of the combustion provides an excellent natural mixing means. Furthermore, in the present invention, since the oxidizer (ambient air) is in a gaseous state, and the fluid arriving through the inlet paths is converted to a gas phase, right at the combustion chamber, no valves (for sealing any toxic/reactive gases) are required. Thus, the present invention drives towards one goal, the ability to miniaturize the entire engine into a miniature device without the need for any moving parts.

Accordingly, it is requested that the rejection of amended independent claim 1 and dependent claims 2-26 be withdrawn. It is submitted that claims 1-26 are now allowable.

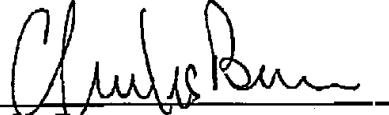
Any additional fees required in connection with this communication which are not specifically provided for herewith are authorized to be charged to the Deposit Account No. 50-2638 in the name of Greenberg Traurig, LLP. Any overpayments are also authorized to be credited to this account. Any extensions of time that are necessary for this paper, or any extensions of time that will be required for papers to be submitted in this case in the future, are hereby generally requested.

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In view of the above, it is submitted that this application is now in good order for allowance, and such early action is respectfully solicited. Should matters remain which the Examiner believes could be resolved in a telephone interview, the Examiner is requested to telephone the Applicants' undersigned attorney.

Respectfully submitted,



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